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CLASSIFICATION OF AMERICAN UPLAND COTTON

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INTRODUCTION.

The present method of grading cotton dates back to about 1800, when grade names were first used in Liverpool, England. Until recently, those engaged in the trade—that is, the cotton merchant, broker or factor, and the spinner—were practically the only persons who classified or graded cotton. The producer rarely knew the grade of his cotton or for what use it was best suited.

Very few outside of those actually engaged in the trade had the opportunity of acquiring such knowledge until within the last few years. At present, almost all of the agricultural schools of the Southern States have added cotton grading to their regular courses of study. The county agents of the United States Department of Agriculture in the cotton States have been supplied with practical forms of the Official Cotton Standards of the United States, and the growers are able to make use of these copies to a considerable extent.

Several years of experience are necessary to learn to classify all the grades and qualities of cotton, but the grower need not be familiar with all of the grades. Often it is enough if he knows three

¹ This is a revision of the U. S. Department of Agriculture Farmers' Bulletin 591, "The classification and grading of cotton," by D. E. Earle and W. S. Dean, which bulletin was written in 1914 before the passage of the U. S. cotton futures act, and was based on the permissive standards. See U. S. Department of Agriculture, Office of Markets and Rural Organization, Service and Regulatory Announcements Nos. 1, 6, and 10, for a discussion of the new Official Cotton Standards established and promulgated on December 15, 1914, and reestablished August 12, 1916.

NOTE.—This bulletin should be of interest to cotton growers and ginner, agricultural and textile students, and to all engaged in the cotton trade.

grades: Low Middling, Middling, and Good Middling, since this range of grades covers the bulk of the white cotton grown in an average season. By practicing with a full set of types for comparison, a knowledge of the other grades may be gained gradually. Such knowledge, coupled with information regarding the corresponding market prices would be very useful to the grower and ultimately encourage him to produce a better quality of cotton and to handle it with more care.

The purposes of classifying cotton are to aid (1) in determining the comparative values of the different qualities and (2) in describing the cotton so as to make buying and selling more satisfactory when samples are not available. With the present method of buying cotton, especially the short-staple varieties (three-fourths of an inch to $1\frac{1}{16}$ inches), other things being equal, the grade has been the chief factor considered. In some cases, however, very little discrimination seems to be made even on this score.¹ What is known as staple cotton ($1\frac{1}{2}$ inches in length of staple or longer) is usually sold on type or sample. The sample gives each party to the trade a chance to form his own opinion, and is necessary because cotton dealers and spinners have different ideas about the actual length of staple.

CLASSIFICATION ACCORDING TO GRADE.

GRADE NAMES.

The Official Cotton Standards of the United States for white cotton were established and promulgated on December 15, 1914, by the Secretary of Agriculture, in conformity with the United States cotton futures Act of August 18, 1914. After the reenactment of the act on August 11, 1916, they were reestablished and include the following grades:

- | | |
|--------------------------|--------------------------|
| 1. Middling Fair. | 6. Strict Low Middling. |
| 2. Strict Good Middling. | 7. Low Middling. |
| 3. Good Middling. | 8. Strict Good Ordinary. |
| 4. Strict Middling. | 9. Good Ordinary. |
| 5. Middling. | |

This range of grades covers practically all the white cotton grown in an average season. Figure 15, showing cotton of the grades Middling Fair and Good Ordinary, represents the extreme range of grades covered by the Official Cotton Standards of the United States.

Under the terms of the United States cotton futures Act each of the above standards is recognized as a full grade, and each grade will be so treated in this bulletin. Middling, as the name indicates,

¹ See Taylor, Fred, Relation between primary market prices and qualities of cotton. U. S. Department of Agriculture Bull. 457, 1916.

is the middle or basic grade, and is the grade upon which the market quotations are based. All grades above Middling should bring higher prices, and all below Middling lower prices than that quoted for Middling, the amount above or below varying according to the commercial differences in use where the cotton is marketed.

Other names are used to describe the different classes of colored cotton. The grades of white cotton, however, are the foundation of all these other classes. When the cotton is not white its nature or class is customarily indicated by adding to the grade the words "off color," "spotted," "yellow tinged," or "yellow" or "blue stained," as the case may be. In other words, at some markets there may be several classes of the same grade of cotton; e. g., Middling off color, Middling spotted, Middling yellow tinged, or Middling yellow or blue stained.

FACTORS THAT DETERMINE THE GRADE.

The principal points to be considered in deciding the grade of cotton are (1) foreign matter or impurities, such as leaf, dust, sand, motes, and cut seed; (2) color; and (3) quality of ginning.

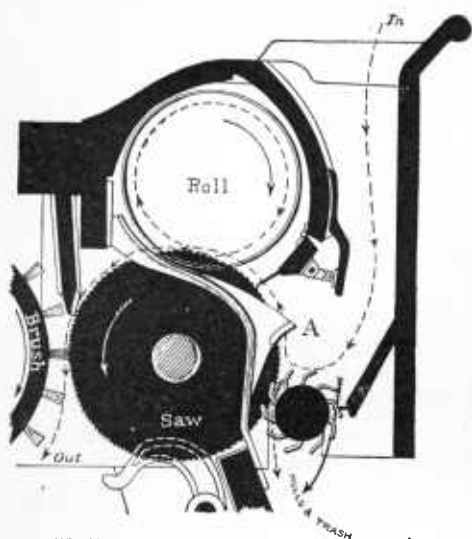
With cotton that can be classed as white, the amount of foreign matter or impurities is of greater importance than color in determining the grade. The cotton merchant, in filling the spinners' orders, must rate the length, strength, body, cling or drag, and uniformity of the staple, as well as the grade. The relative spinning values, therefore, will be considered apart from the grade.

FOREIGN IMPURITIES.

Leaf, dust, and sand.—The amount of leaf, dust, and sand in cotton depends largely upon the weather. Usually there is very little leaf when cotton is picked before the vegetation is killed by frost.

Practically all low-grade cotton carries a trace of dust or sand, or often both, which to a limited extent affects the grade. When, however, there is an abnormal amount of either dust or sand, a penalty separate from that for grade is made. As much as 50 pounds more of these impurities have been extracted from one bale of low-grade cotton by the use of cleaners at the gin. If up-to-date machinery were used for the whole crop, there would be few bales below Low Middling in grade. If cotton were sold on grade, the increase in price should offset the loss in weight, and at the same time the cost of ginning would be reduced, since such cost frequently is based on the weight of lint cotton ginned. Much of the leaf, dust, sand, and hulls may be removed by the use of "huller" gins (see fig. 1). Cleaners properly used in connection with any type of gin also improve the sample from one to two grades. Either

type of gin (see fig. 2), however, turns out a cleaner and better sample if the cotton is thoroughly dry when ginned and the saws, brushes, and other parts of the gin are in good condition.¹



Hulls and trash removed at A

FIG. 1.—Sectional view of huller gin.

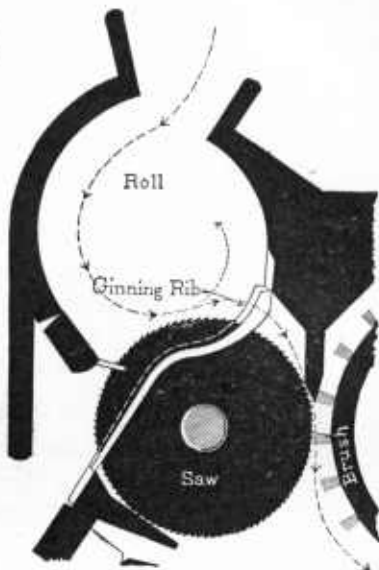


FIG. 2.—Sectional view of plain gin.

Motes.—Motes (fig. 3) are immature seeds or ends of seeds, that are pulled off in ginning. Immature seeds are found more or less in all cotton, the number depending upon the variety and the weather conditions during its growth and maturity. Their presence lowers the grade of cotton, as they go out as waste in the manufacturing processes.



FIG. 3.—Motes.

QUALITY OF GINNING.

A properly ginned sample (fig. 4) is smooth, while a poorly ginned sample may contain neps, gin-cut staple, or may be stringy and rough in appearance.

Neps and gin-cut staple.—Neps and gin-cut staple (figs. 5 and 6) may be caused by feeding cotton to the gin too fast, by the gin being in bad order, by the presence of immature staple, or by dampness in the cotton when ginned. Neps look like small white dots. They may be seen best

¹ See Taylor, Fred, Griffith, D. C., and Atkinson, C. E., Cotton ginning information for farmers, U. S. Department of Agriculture Farmers' Bul. 764, 1916.

when a thin layer of the cotton fibers is held toward the light. The cut fibers show in bunches and V-shaped kinks, thus giving the sample a rough appearance. It is difficult to judge the grade or value of gin-cut cotton, so, in order to be on the safe side, the buyer often penalizes such cotton from one-half to two cents per pound.

Stringy cotton.—Stringy cotton (fig. 7) is defective cotton produced by the ginning of wet or immature seed cotton, or sometimes by the wrong adjustment of the brushes that take the lint away from the gin saws (see fig. 1). The fibers in these strings

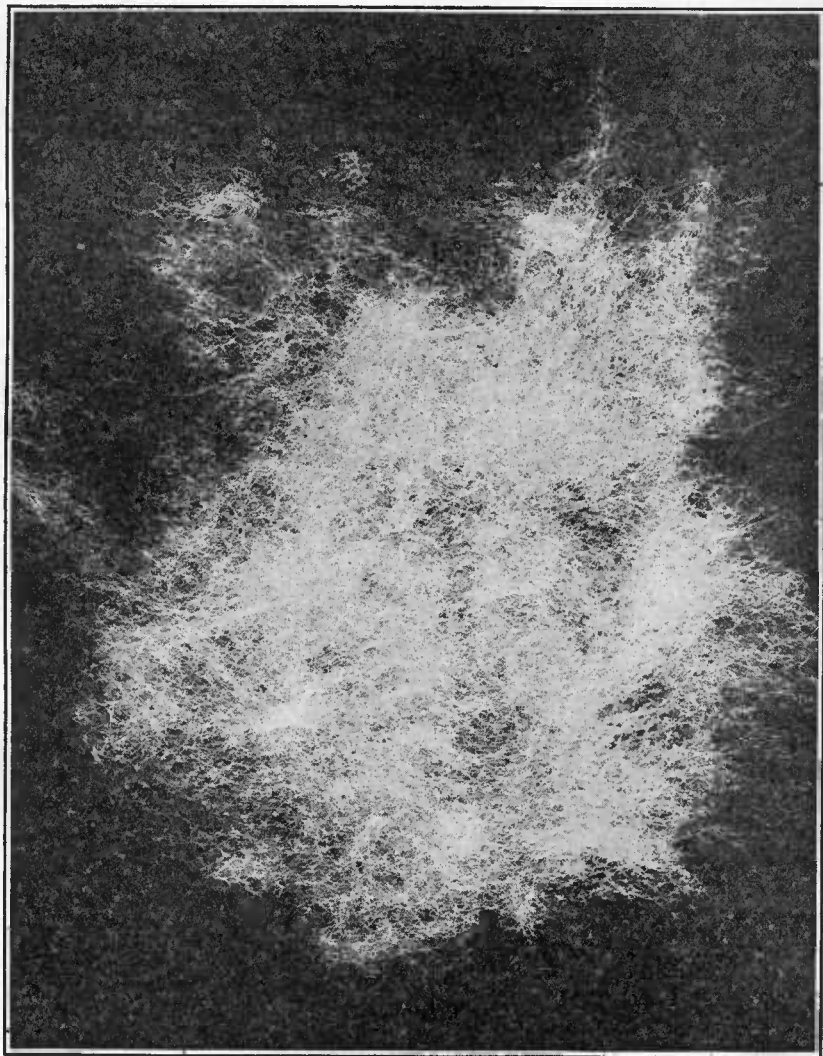


FIG. 4.—Smoothly ginned cotton.

do not separate very easily, while many of them are discarded in the first cleaning processes at the mill and go into the waste.

Cut seed.—Cut seed (fig. 8) are caused by fast ginning with a hard roll, and by broken or bent gin saw teeth that strike the grate

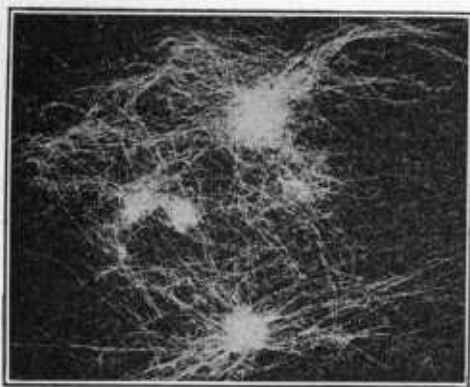


FIG. 5.—Neps.

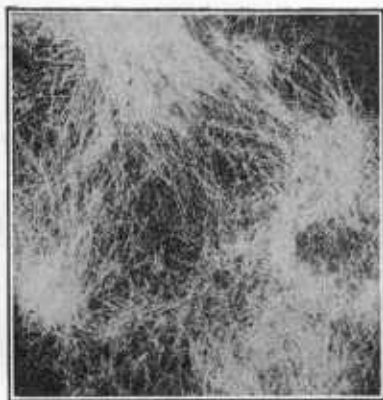


FIG. 6.—Gin-cut staple.

bars. Cut seeds have their effect upon the eye and touch in grading, increase the amount of waste and reduce the grade according to the amount contained in a given sample.



FIG. 7.—Stringy cotton.



FIG. 8.—Cut seed.

COLOR AS ASSOCIATED WITH GRADE.

The Official Cotton Standards of the United States for grade require that cotton grading Strict Good Middling or above be of a bright, creamy, or white color, and free from any discoloration. A

definite or fixed color is not absolutely required in the grades below Strict Good Middling. For instance, a sample grading Middling may be creamy or "dead" white, and this identical color might be found in a sample grading either Strict Middling or Strict Low Middling. In the grades below Middling, however, the bright creamy color or bloom is usually lost, since climatic and soil conditions, that lower the grade to this extent, also affect the color, often giving either a "dead" white, a gray, or a dingy or reddish cast to the lower grades, although they pass commercially as white cotton. The meaning of the word "white" is therefore relative when applied to cotton.

Variations in color can best be seen when the cotton is placed in a north light. If working out of doors, the grader's back should be turned toward the sun so that his line of vision will be more or less parallel to the rays of light. The best light for grading may be had on a clear day during the hours from 9 a. m. to 3 p. m. It is sometimes difficult to judge the color of cotton on a day that is cloudy or partly cloudy because of improper or reflected light.

CLASSIFICATION ACCORDING TO COLOR.

NAMES OF COLOR STANDARDS.

In conformity with the authority given by the United States cotton futures Act of August 18, 1914, the Secretary of Agriculture on January 28, 1916, established and promulgated standards for color which were reestablished and promulgated immediately after the re-enactment of the act on August 11, 1916. These standards cover the following colors and grades:

- Yellow Tinged Cotton of the grade of Low Middling.
- Yellow Tinged Cotton of the grade of Strict Low Middling.
- Yellow Tinged Cotton of the grade of Middling.
- Yellow Tinged Cotton of the grade of Strict Middling.
- Yellow Tinged Cotton of the grade of Good Middling.
- Yellow Stained Cotton of the grade of Middling.
- Yellow Stained Cotton of the grade of Strict Middling.
- Yellow Stained Cotton of the grade of Good Middling.
- Blue Stained Cotton of the grade of Middling.
- Blue Stained Cotton of the grade of Strict Middling.
- Blue Stained Cotton of the grade of Good Middling.

There is a greater diversity of opinion in the trade concerning the grade and value of these three classes of colored cotton than is the case with white cotton. It is estimated that on an average about one-fifth of the American cotton crop falls within the above standards for color. The economic advantage of uniform standards for handling these classes of cotton is therefore obvious. The names and methods as now applied in the classing and grading of colored cotton by the Official Cotton Standards of the United States as above named are slightly different from those formerly used by the trade.

Each of the color standards now contains approximately the same amount of leaf and foreign matter as the corresponding grade of the white standards. The yellow tinges and yellow stains formerly were referred to merely as "tinges" and "stains," respectively, and the intensity of the color decided, in many cases, the grade assigned to the sample. In so far as authentic information is at hand, there never had been a separate standard for blue cotton in general use, either in America or Europe. Heretofore such cotton has been classed largely according to its value based on the white standards for grade, or else it has been sold on type or sample.

FACTORS THAT INFLUENCE THE COLOR.

The weather and the soil are factors that influence the color of cotton. The early pickings, when not exposed to rain, usually have a bright, creamy color, and if picked with ordinary care should class perhaps good middling or better in grade. If left in the field too long, however, the luster is lost and the color of the cotton changed to a "dead" or grayish white that may reduce the grade to Middling or perhaps below, depending upon the quantity of leaf and foreign matter. The action of frost on the late bolls before they open may change the cotton to a different color class, as Middling Yellow Tinged, or Middling Yellow Stained, according to the degree of color. The yellow tinges are mixed with white cotton in variable proportions, while the yellow stains are of almost a solid yellow, reddish, or buff color. Cotton grown on red soil also may be discolored by the rain during the harvesting season.

Blue color in cotton is a stain usually due to mildew, caused by exposure in the boll to continued rains, together with staining from the dead vegetation of the plant. Such color also may be due to exposure after the cotton is ginned and baled.

CLASSIFICATION ACCORDING TO LENGTH OF STAPLE.

It is usual in the trade to call cotton that averages in length of staple $1\frac{1}{8}$ inches or more "staple cotton" and that which averages less than $1\frac{1}{8}$ inches "short-staple" cotton.

Long-staple cotton, with the exception of Sea Island and Egyptian, is classed according to grade in practically the same way as short-staple cotton, although graders are usually more liberal as regards curls, strings, and general smoothness of the cotton. The reason for this is that in ginning long-staple cotton with either the saw or roller gin the fibers become more tangled, forming curls and strings which affect the general smoothness of the cotton. Another reason is that the length and general character of long-staple cotton are the principal factors that decide the price. The buyer

looking for a lot of cotton with the desired length of staple will not be as particular with the grade, within certain limits, as with the staple.

There is no fixed length of staple used as a basis in many of the primary markets for what is known as "short cotton." At present, very little difference is made by local buyers in the prices between different lengths of cotton ranging from three-fourths of an inch to 1 inch if the grade and other qualities are equal. One-inch cotton, however, is worth perhaps just as much more above three-fourths of an inch cotton as Good Middling is worth above Middling, and should bring a corresponding premium. It is only a question of time, it is believed, when closer distinctions will be made in this respect.¹

Table I shows roughly the average premiums that have prevailed for the past three years (1913-1916) for the various lengths of staple of $1\frac{1}{8}$ inches to $1\frac{1}{2}$ inches for Strict Middling Delta cotton, based on the price of Strict Middling short cotton of the same growth. These premiums are only approximate averages, and, of course, vary considerably from year to year according to supply and demand.

TABLE I.—Averages of premiums for Strict Middling Delta cotton $1\frac{1}{8}$ inches to $1\frac{1}{2}$ inches in length of staple, based on price of Strict Middling Short cotton of the same crop, 1913-1916.

Length of staple.	Premium.
<i>Inches.</i>	<i>Cents.</i>
$1\frac{1}{8}$	$1\frac{1}{2}$
$1\frac{3}{16}$	$2\frac{1}{4}$
$1\frac{1}{4}$	4
$1\frac{5}{16}$	$5\frac{1}{2}$
$1\frac{3}{8}$	$6\frac{1}{2}$
$1\frac{7}{16}$	$7\frac{1}{2}$
$1\frac{1}{2}$	9

The premiums usually are relatively higher for Delta cotton, owing to its more desirable character, than for cotton of the same grades and lengths of staple grown in other sections. In the case of staple cotton the premiums are relatively higher for the grades above Middling, and the penalties greater for the grades below Middling, than with short cotton, since staple cotton is used in the manufacture of fine goods, where clean yarn of a bright color is desired. Nevertheless, every additional one-sixteenth of an inch in the length of the staple usually adds more to the market value of staple cotton than does the difference of a grade in its classification.

Length of staple is determined by a process know as "pulling the staple." A small piece of cotton is grasped with both hands and

¹ For a discussion of the agricultural importance of such distinctions in encouraging improvement in cotton production, see Cook, O. F., "The relation of cotton buying to cotton growing," U. S. Department of Agriculture Bulletin 60, 1914.

pulled apart. One-half is then discarded, and the ends of the fibers projecting from the portion held usually in the left hand are grasped between the thumb and forefinger of the right hand and drawn from the mass. Two or three such pulls are made and the staple is then lapped back and forth until the fibers are parallel and the ends squared before the length is estimated. The character of the staple—that is, its strength, body, drag, and uniformity—is also noted at the same time.

There is a greater difference of opinion concerning length of staple than there is concerning grade. Different experts vary considerably in their estimates of the length of the same sample of cotton, sometimes from one-eighth to three-sixteenths of an inch in the longer lengths. This is often due, no doubt, to the fact that they do not “pull” the staple in the same way. A rule used for measuring the drawn sample, therefore, is not always a sure index of the length, for one classer may discard more short or long fibers than another. If, however, all branches of the trade had the same type or standard sample of cotton for 1 inch, $1\frac{1}{8}$ inches, and $1\frac{1}{4}$ inches, etc., cotton could be compared with the standard, both being pulled in the same way, and doubtless a greater uniformity could be established. At present what the spinners at New Bedford, Mass., and other fine yarn spinners in the East call $1\frac{1}{8}$ inches other sections of the country may call $1\frac{1}{4}$ inches.

The need of such a standard is recognized, but the maintenance of a standard of the same general character as well as length year after year for the different lengths of staple presents serious difficulties. Merchants find it necessary to spend a large sum selecting bales at the beginning of each season from which types are sent to their various customers, and make their sales not with reference to a given length of staple but in conformity with the types furnished.

CLASSIFICATION ACCORDING TO CHARACTER.

In addition to the above classifications covering grade, color, and length of staple, the value of any cotton for spinning purposes is also largely influenced by its character, which refers to the strength, body, drag, and uniformity of staple.

These characteristics vary in cotton from year to year, owing to the season, soil, fertilizer used, and variety of seed planted. It has not thus far been found advisable, therefore, to attempt to maintain uniform standards covering these variable characteristics in the staple of cotton.

Strength.—Strength of fiber is one of the principal spinning qualities of cotton, for upon this—other characteristics being equal—depends the strength of the yarn. The soil, variety, time of maturity, and season or climate are the factors that influence the strength of

the staple. The second or third picking, made before the top crop opens, often gives a better character of staple, and sometimes longer staple, than is found in the first picking. Generally speaking, however, the staple in a Good Ordinary or Low Middling sample is weaker than that of the higher grades, owing to weather exposure and perhaps to immature staple that is often found in these grades from the top crop. Stained cotton and, to a lesser degree, tinged cotton usually is found to be of weaker staple than that of the corresponding white grade. These lower grades and classes of cotton often contain immature staple and at times perished staple. Immature staple usually has a glossy appearance, and the fibers are often matted together (see fig. 9). Bolls of cotton that are picked before they are well opened, and also the top bolls when forced open by the action of frost, contain immature staple. Cotton of perished staple is such as has had the strength of fiber destroyed or unduly reduced through exposure either to the weather before picking or after baling, to heating by fire, on account of water packing, or through other causes.¹ Immature staple or perished staple is undesirable for manufacturing purposes; it makes weak yarn, and a large amount of waste. The market value of such cotton is accordingly reduced.



FIG. 9.—Immature staple.

Body and drag.—The body of cotton is closely related to its strength, while drag refers to the cling or resistance offered when a tuft of the sample is being pulled or broken. Heavy-bodied cottons are usually grown on bottom or fertile land, while the lighter-bodied cottons are produced on thin soil or under adverse weather conditions.

Uniformity in the length of staple is of equal importance to that of strength or body to the manufacturer, for the amount of waste in the manufacturing processes depends largely upon the degree of uniformity in the staple of the stock used. Wasty or uneven staple in cotton may be caused by planting poor varieties or mixed seed of two or more varieties, or by poor ginning. Several years of careful selection of a suitable variety is necessary in order to develop a uniform quality of fiber.

¹ See U. S. Department of Agriculture, Office of Markets and Rural Organization, Service and Regulatory Announcements No. 10, 1916.

TRADE NAMES AND REGIONAL CHARACTERISTICS.

There are certain grade characteristics in cotton that often indicate the section of the country in which the cotton was grown. The sections most commonly referred to in the American cotton industry are three in number and give rise to cotton of three regional trade names—Upland, Gulf, and Texas. Each of these types is subdivided and sold under many other trade names that tell more nearly the character of the cotton and where it was grown. All American cotton, however, except Sea Island and Arizona-Egyptian, is of the Upland species.

Upland cotton.—The “Upland” type of cotton constitutes the bulk of the American crop and is perhaps the most generally used cotton grown. It is produced almost throughout all the inland districts of the cotton-growing States, but chiefly in North Carolina, South Carolina, Georgia, Alabama, Tennessee, and Virginia. Much cotton that is grown in the hilly parts of Mississippi, Louisiana, Texas, and Arkansas is sold as Upland. This cotton averages seven-eighths of an inch to 1 inch in length of staple, although a number of long-staple varieties up to $1\frac{5}{8}$ inches in length are being grown successfully in the Upland districts. In parts of the Piedmont section, shown on the soil map (fig. 10) by the letter D, the length is very often more than 1 inch, while in the sand hills and coastal plains a considerable amount is often less than seven-eighths of an inch, and more fluffy in appearance. Cotton grown in the Piedmont section generally has a bright, creamy color, or “bloom,” which is considered desirable by many spinners. The leaf is usually black and in rather small pieces, while in the cotton from the sandy soil the color is generally whiter and the leaf larger and brighter. Atlantic States cotton changes color faster when left in the field than western cotton. It takes on a bluish cast and is often spotted or tinged if grown on a red clay soil. This is no doubt due, in part at least, to the greater rainfall in the Eastern States during the gathering season (see fig. 11.)

Gulf cotton.—As the name indicates, “Gulf” cotton is grown in the States bordering on the Gulf of Mexico and in the basin of the Mississippi River. In using this name, many in the trade seem to refer to a cotton of $1\frac{1}{8}$ inches staple or something better than the ordinary seven-eighths of an inch to 1 inch Upland cotton, regardless of whether it is grown on the Gulf or not. The length of staple, however, does not decide the grade or the regional trade name, for a considerable quantity of $1\frac{1}{8}$ inches to $1\frac{1}{2}$ inches cotton is grown in the Upland districts. The general color of Gulf cotton is whiter and the particles of leaf often larger and blacker than that in either Upland or Texas cotton. It also has what is known in the trade as a “heavier body.”

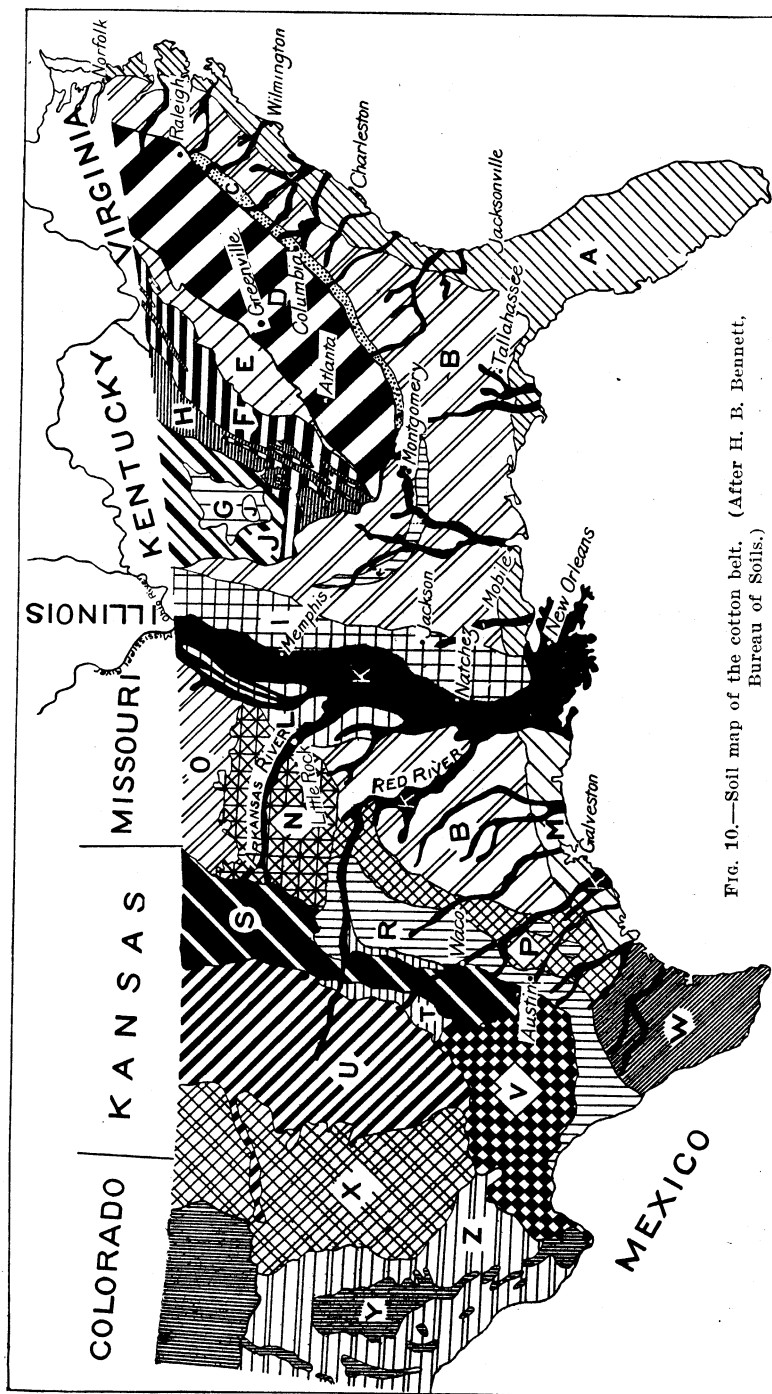


FIG. 10.—Soil map of the cotton belt. (After H. B. Bennett, Bureau of Soils.)

EXPLANATION.—A, Atlantic and Gulf flatwoods. Light-colored sands and dark, poorly drained soils predominate. B, Interior Atlantic and Gulf coastal plains. C, Sand hills. D, Piedmont plateau. I, Loessial region, silt and loam. K, River flood plains, subject to overflow. L, Silty terrace lands. M, Coastal prairie, low flatland, marshy near coast. N, Ozark and Ouachita Mountains. P, Coastal plain, mixed "post-oak land" and prairie. R, Black prairie, calcareous black-way lands. S, Black prairie, sandstone, shale, and limestone. U, Red prairie, sandstone, and shale soils. "Red Beds" region. V, Edwards and Stockton plateaus. W, Rio Grande plain. X, Staked plain.

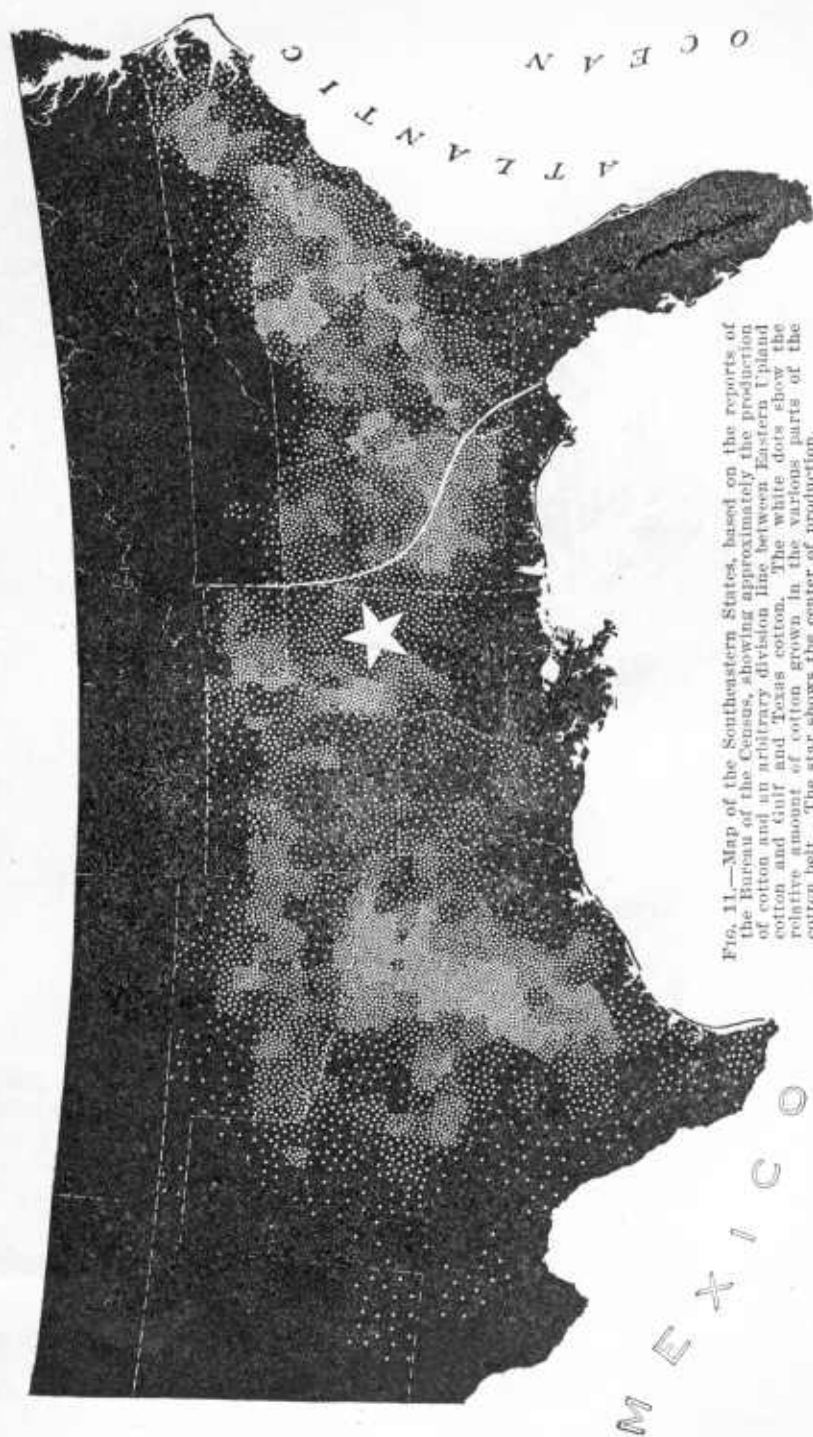


FIG. 11.—Map of the Southeastern States, based on the reports of the Bureau of the Census, showing approximately the production of cotton and an arbitrary division line between Eastern Upland cotton and Gulf and Texas cotton. The white dots show the relative amount of cotton grown in the various parts of the cotton belt. The star shows the center of production.

The word "Gulf" is not used much in the actual buying and selling of cotton, other trade names that have a more definite meaning being employed. The most common of these trade names are "Peelers," "Benders," "Rivers," "Canebrake," and "Red River," although a number of so-called varieties may be sold under each of these names.

"Peelers" was formerly a varietal name which is now seldom used, but when used is applied rather indiscriminately to the $1\frac{1}{4}$ -inch Mississippi delta cotton.

"Benders" is not a varietal name. It is applied to cotton of good body, $1\frac{1}{8}$ to $1\frac{3}{16}$ inches in length of staple, which is grown along the Mississippi, Arkansas, and White Rivers. The word is said to have applied originally only to cotton that grew in Mississippi, Louisiana, and Arkansas and along the bends of the Mississippi River.

"Rivers" is used in referring to bottom-land cotton having a medium-bodied staple of $1\frac{1}{16}$ to $1\frac{1}{8}$ inches, though if the cotton has a light body it is sometimes called "Creeks" in some sections of the Mississippi Delta.

"Canebrake" is the name applied to cotton that is grown in the south-central part of Alabama on the strip of black prairie land shown on the soil map (fig. 10) by the letter "r." Most of this cotton has a strong $1\frac{1}{16}$ inch staple and brings a higher price than other Alabama cotton.

Texas cotton.—"Texas" is the trade name given to cotton grown in Texas and Oklahoma. This generally has about the same length of staple as Upland cotton except that grown in the river basins and black prairie, where the length is usually $1\frac{1}{16}$ to $1\frac{1}{8}$ inches. Texas cotton is considered to be of better spinning value than ordinary Upland cotton on account of its "heavy body" even though the staple is the same length. The character of the fiber of Texas cotton varies considerably from year to year. When the growing season is dry, the fiber is harsher and shorter than usual, while the color may have a reddish tinge. Many of the leaves are dried up early in the picking season by the heat and drought. This, no doubt, accounts for the fact that the leaf in this cotton is a brighter color and more broken or peppery than it is in either the Gulf or Atlantic States cotton. A large quantity of boll hulls, shale,¹ and stalk is often found in this cotton, especially in Oklahoma and northern Texas, where all of the top crop does not mature, owing to the shorter growing season.

These half-opened bolls and the bolls that do not open at all are usually ginned in a "double-rib" huller gin, and the cotton is known

¹ The inner lining of the boll, resulting from the crushing and separation of the boll hulls from the cotton at the gin, is known as shale.

in the trade as "bollicies." "Bollicies" are usually of a bright yellowish color and the staple is softer and more fluffy than that in normally matured cotton.

Another type of cotton, known as "snapped," or "machined" cotton, where the open and mature bolls have been gathered with the bur, is found in this section near the end of the picking season. This cotton, although often resembling "bollicies" in the amount of shale and hull contained in it, has a superior fiber and may be graded in the usual way.

CLASSIFYING BY STANDARDS.

In order to obtain uniformity in the classification of cotton, an occasional reference to the standards is desirable. The light

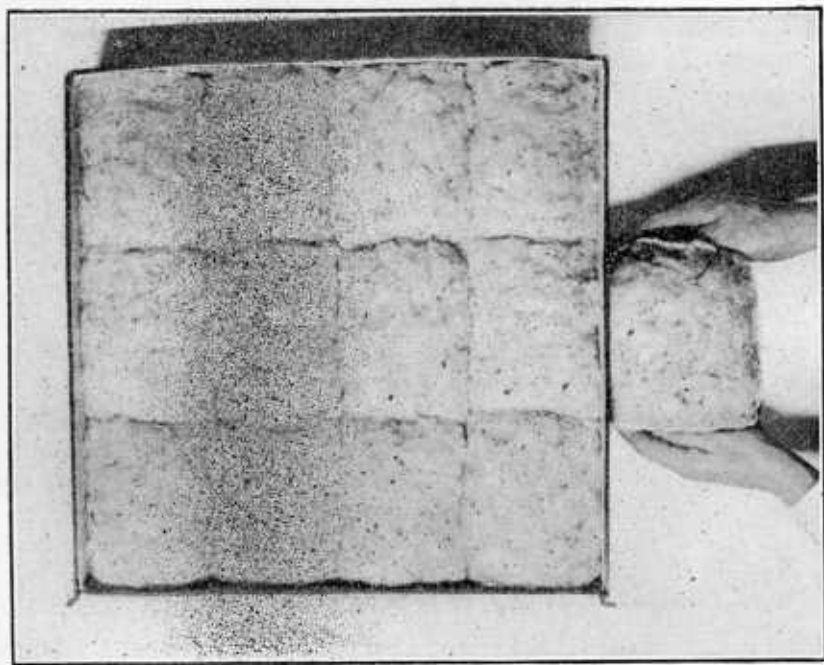


FIG. 12.—Grading by standards.

causes the same cotton to appear very different at times. Classers often disagree as to the grade or class of a sample, even after reference has been made to the standards. For beginners it is easier to match cotton against the standards if types of the cotton to be graded are placed for the time being in a box similar to the boxes containing the types of the standards. (See Fig. 12.) The cotton in question may then be matched by placing the prepared box of cotton to be classed by the side of the boxes containing the stand-

ards until the class is determined. This method gives a greater surface for comparison and also practically the same light on each box.

The Official Cotton Standards of the United States were prepared with a view of representing the various characteristics of cotton grown throughout the cotton belt. In making copies of these standards for sale, cotton has been selected from almost every cotton-growing state. Each grade box contains twelve samples, so as to indicate the slight range or diversity allowed within the grade; for example, there may be one type of Low Middling of a reddish cast with bright leaf, and another of a grayish or bluish cast with black leaf; in one sample the leaf may be in large pieces, while in another it may be broken up in small pieces known as "pin" leaf. The same variation is found within the grade boxes of each of the nine official grades, the diversity being less marked above Middling than below. Still more latitude has been allowed in the preparation of the standards for color. For instance, in the same box, a Middling Yellow Tinged type from Oklahoma may have a reddish cast, while a Middling Yellow Tinged type from Georgia or Alabama may have a dull or grayish cast.

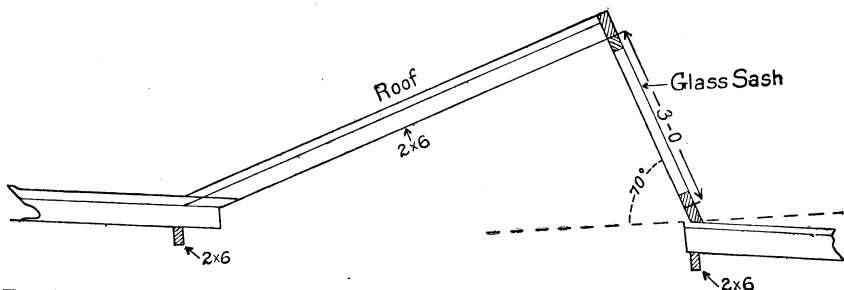


FIG. 13.—Sectional view of a skylight that may be placed on the roof of a warehouse or cotton shed, in order to get a north light for grading.

The cotton classer is continually encountering bales that will pass for a certain grade or class of cotton although they do not resemble identically any particular type in the standard. In reality, no two bales of cotton are exactly alike. Many samples must be assigned to a certain grade according to their valuation based on the standard.

A skylight is considered more desirable for viewing cotton than a sidelight. However, when it is not feasible to add a skylight (see fig. 13), several large windows may be placed side by side preferably in the wall facing north.

The table for holding the grade boxes should have a top inclined toward the light at an angle of approximately 30° in a room where a skylight is used, and at about 45° where the side light is used.

SAMPLES FOR USE IN CLASSIFICATION.

In sampling a bale of cotton for classing, about three ounces should be drawn from each side of the bale. When samples are drawn from a bale of compressed cotton they should be exposed to the air before grading, so that the matted condition and deadened color may disappear. Classers are liberal in grading compressed cotton, because the leaf and dirt are more condensed, and the general appearance of the sample is rougher. An allowance of about one-half grade should be made when classing compressed cotton, especially of the lower grades, immediately after sampling.

Recent experiments have been made by the Office of Markets and Rural Organization in order to determine the effect of compression upon the grade of cotton. These tests were conducted on three 100-bale lots which were obtained in New Orleans, La., Gadsden, Ala., and Little Rock, Ark. A sample was taken from each bale of cotton before compression; these samples were then graded very carefully and the average grade determined.

Each of the three 100-bale lots was then sent to a compress and compressed in the usual manner. Samples were again drawn from each lot five days after compression and graded immediately after being drawn. They were graded a second time after an interval of 24 hours and again a third time after an interval of 48 hours. The grade of these bales ranged from Low Middling to Good Middling.

The following is a condensed statement of the average prices in points "on" or "off" Middling obtained by grading the 300 bales handled in the manner as above outlined:

Total number of bales.	Grading before compression.	Grading immediately after compression.	Grading 24 hours after compression.	Grading 48 hours after compression.
300	3 points on Middling.	11 points off Middling.	2 points off Middling.	3 points on Middling.

It will be noted that the average price on the third grading, which was made 48 hours after the samples were taken from the compressed bales, is identical with the average price of the cotton previous to compression.

Samples from bales should be drawn in smooth sheets, and preferably when the bale is dry. The sample being classed should be unfolded three or four times and examined, since the leaf and dirt are not always evenly distributed. This unevenness is largely due to the fact that the cotton in any such sample came from several parts of the field and was perhaps picked by a number of persons. The different pickings made from time to time are often stored together,

and this may give a considerable variation, especially during the latter part of the season. It is also the custom in some sections for cotton to be sold in the seed at the gin.¹ Many loads of cotton originating in different sections are thus mixed in one large bin before ginning. This practice also causes mixed grades and qualities of cotton.

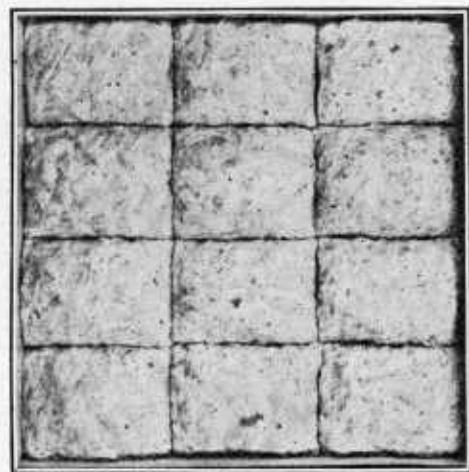
Many bales have on one side a thin "plate" that is of a higher or lower grade than the rest of the bale. Plating is usually caused by a "roll" being left in the "breast" of the gin from cotton of a different lot previously ginned. A sample from such a bale should be drawn, therefore, from a sufficient depth to be fairly representative of the bale. Plated bales have no doubt caused great loss to the producers, as cotton is classed on the basis of the low side or poorest quality shown in the bale.

CARE OF THE PRACTICAL FORMS OF THE STANDARDS.

Very few people seem to realize the importance of protecting the copies of the standards from light and dust. Only the surface of the cotton shows the grade, and exposure to light and dust will in a short time so change the appearance of the surface that it does not actually represent the grade or class as certified. It has been found necessary in the standardization work at Washington to compare the "working" sets, which are used daily as copies in the preparation of practical forms of the official standards, with the official sets each week. The luster or bloom in the high grades is bleached out by light, and this bleaching, together with the dust that collects on the cotton, has the effect of lowering the grade, while the bleaching of the color in the lower grades tends to improve their appearance.

The appearance of the standards is also found to undergo slight changes even when not in use. The surface of the samples is free from pressure, thus allowing the cotton to "fluff up," and giving it a brighter appearance, and the roughness, especially in the lower grades, also disappears to some extent. The opening of the lid has a tendency to loosen the surface and unless it is closed with care the loose leaf may be blown off or disturbed. It is considered that the types in the standards more accurately represent cotton in its natural state when free from pressure by the lid, and the official standards for grade have been so prepared. Owing to the more variable and fugitive character of the color in the colored standards, the types have been prepared so as to fill the box, allowing

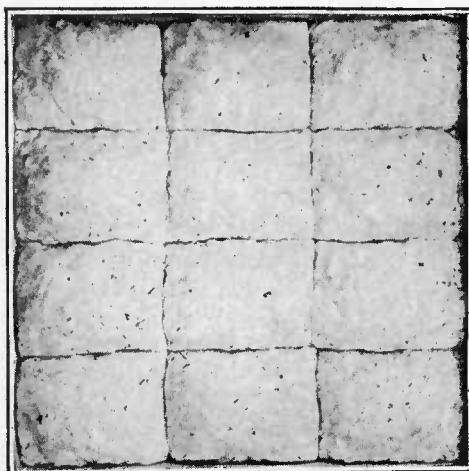
¹ See Creswell, C. F., Disadvantages of selling cotton in the seed. U. S. Department of Agriculture Bulletin 375, 1916.



Low Middling.



Middling.



Good Middling.

FIG. 14.—Good Middling, Middling, and Low Middling of the Official Cotton Standards of the United States. These grades cover the bulk of the white cotton grown in an average season. The use of such grades in connection with quotations from responsible markets (see Table II) should prove to be profitable for those who have cotton for sale.

a slight pressure from the lid. More air is thereby excluded, and the surfaces of the types better preserved. Experience shows that when practical forms of the standards are in use they are frequently not true copies of the official standards longer than about one season, and often not that long. Color may even be destroyed within a few days if the practical forms are left exposed to light.

RELATIVE VALUES OF DIFFERENT CLASSES.

Table II shows the average premiums and penalties in cents per pound on and off middling in various markets throughout the United States, based on the official cotton standards of the United States for grade (see figs. 14 and 15), from August 1, 1915, to August 1, 1916; while Tables III and IV give the same information based on the official cotton standards for color from March 15, 1916, when quotations were begun officially on these standards, to August 1, 1916.

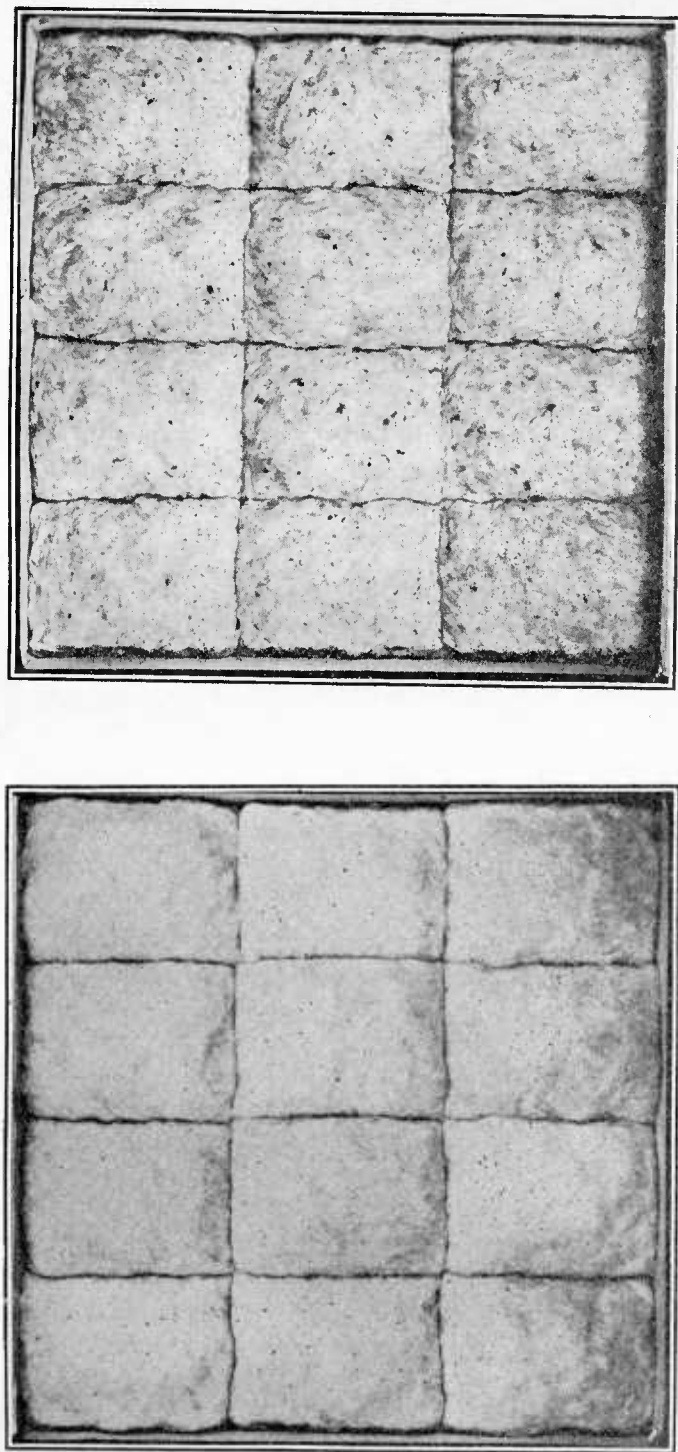


FIG. 15.—Middling Fair, the highest, and Good Ordinary, the lowest, of the Official Cotton Standards of the United States. The average quotations for Aug. 1, 1915, to Aug. 1, 1916, from 11 of the largest spot markets in the United States (Table II), showed a difference of \$14.50 per bale between the value of these grades. When the average grade of the crop is lower than that of the past season the difference between the market prices of these grades is considerably wider.

TABLE II.—Average differences in value on and off Middling for short cotton, based on the official cotton standards of the United States for grade, from Aug. 1, 1915, to Aug. 1, 1916.

	Mid- dling fair.	Strict good mid- dling.	Good mid- dling.	Strict mid- dling.	Mid- dling.	Strict low mid- dling.	Low mid- dling.	Strict good ordi- nary.	Good ordi- nary.
Norfolk.....	0.91 on	0.68 on	0.43 on	0.22 on	11.61	0.33 off	0.91 off	1.36 off	1.86 off
Augusta.....	.76 on	.63 on	.50 on	.25 on	11.53	.29 off	.72 off	1.23 off	1.79 off
Savannah.....	1.00 on	.75 on	.50 on	.25 on	11.72	.34 off	.80 off	1.29 off	1.77 off
Montgomery.....	.89 on	.75 on	.47 on	.25 on	11.37	.42 off	.90 off	1.36 off	1.74 off
New Orleans.....	1.33 on	.84 on	.55 on	.25 on	11.65	.29 off	.63 off	1.19 off	1.72 off
Memphis.....	1.23 on	.69 on	.44 on	.23 on	11.83	.31 off	.74 off	1.30 off	1.74 off
Little Rock.....	.72 on	.61 on	.42 on	.20 on	11.83	.35 off	.82 off	1.33 off	1.84 off
Dallas.....	1.00 on	.71 on	.49 on	.24 on	11.51	.42 off	.92 off	1.59 off	2.23 off
Houston.....	.95 on	.71 on	.47 on	.24 on	12.00	.47 off	.97 off	1.46 off	2.03 off
Galveston.....	1.08 on	.77 on	.47 on	.24 on	12.06	.39 off	.95 off	1.58 off	2.10 off
Boston.....	1.10 on	.75 on	.49 on	.25 on	.....	.38 off	.85 off	1.47 off	2.20 off
Yearly average.....	1.00 on	.72 on	.48 on	.24 on	11.71	.36 off	.84 off	1.38 off	1.91 off

TABLE III.—Average differences in value on and off middling for short cotton, based on the official cotton standards, for yellow tinges, from Mar. 15, 1916, to Aug. 1, 1916.^a

	Strict good middling yellow tinged. ^a	Good middling yellow tinged.	Strict middling yellow tinged.	Middling yellow tinged.	Strict low middling yellow tinged.	Low middling yellow tinged.
Norfolk.....	.....	0.13 on	0.38 off	0.63 off	1.00 off	1.50 off
Augusta.....	0.25 on	.....	Even.	.25 off	.88 off	1.25 off
Savannah.....	.45 on	.20 on	.05 off	.30 off	.60 off	1.00 off
Montgomery.....	.25 on	.25 off	.50 off	.75 off	1.13 off	1.38 off
New Orleans.....	.13 on	.12 off	.38 off	.63 off	.88 off	1.13 off
Memphis.....	.....	.05 on	.20 off	.32 off	.45 off	.82 off
Little Rock.....	.20 on	.01 off	.25 off	.50 off	.88 off	1.38 off
Dallas.....	.....	.10 on	.13 off	.38 off	.87 off	1.43 off
Houston.....	.25 on	Even.	.25 off	.50 off	1.52 off	1.32 off
Galveston.....	.25 on	Even.	.25 off	.40 off	1.75 off	1.25 off
Boston.....	.25 on	Even.	.24 off	.48 off	.88 off	1.25 off
Average.....	.25 on	.01 on	.24 off	.47 off	.99 off	1.25 off

^a No official standard has been promulgated for strict good middling yellow tinged.

TABLE IV.—Average differences in value on and off middling for short cotton, based on the Official Cotton Standards, for yellow and blue stains, from Mar. 15, 1915, to Aug. 1, 1916.

	Good middling yellow stained.	Strict middling yellow stained.	Middling yellow stained.	Good middling blue stained.	Strict middling blue stained.	Middling blue stained.
Norfolk.....	0.75 off	1.00 off	1.26 off	0.75 off	1.00 off	1.50 off
Augusta.....	.63 off	.63 off	1.03 off	.63 off	1.00 off	1.50 off
Savannah.....	.10 off	.38 off	.62 off	.38 off	.88 off	1.38 off
Montgomery.....	.88 off	1.13 off	1.38 off	.75 off	1.00 off	1.25 off
New Orleans.....	.48 off	.74 off	.99 off	.40 off	.67 off	.89 off
Memphis.....	.12 off	.33 off	.47 off	.36 off	.61 off	.48 off
Little Rock.....	.63 off	.88 off	1.14 off	.83 off	1.20 off	1.45 off
Dallas.....	.75 off	1.00 off	1.25 off	.65 off	.90 off	1.15 off
Houston.....	.50 off	.75 off	1.00 off	.25 off	.50 off	.75 off
Galveston.....	.50 off	.75 off	1.00 off	.35 off	.62 off	.95 off
Boston.....	.....	.70 off	.....	.65 off	1.01 off	1.72 off
Average.....	.53 off	.75 off	1.01 off	.55 off	.85 off	1.18 off

All of the cities named are designated spot markets under the rules and regulations of the Secretary of Agriculture under the United States cotton futures Act, which furnish daily quotations.

The average of such quotations governs the differences in value of cotton of various grades on the future exchanges. These quotations show much more uniformity than existed before the general adoption of the Official Cotton Standards of the United States. The relative values of the grades of cotton—other characteristics being equal—depend chiefly upon the quantity of foreign matter, etc., that goes to waste in the manufacturing process. The difference in price of the various classes of cotton, however, will vary also in accordance with supply and demand. During a season when the grades above Middling are scarce the premiums on the price of Middling are raised, while the penalties on the grades below Middling are also greater when these grades are plentiful and vice versa. In other words, with a high-grade crop the differences are usually narrower and with a low-grade crop the differences widen.

The differences in prices may be due to a number of causes: First, the difference in the character of the cotton that is marketed at the various points; second, the facilities of the market as a shipping point to the Eastern or European points; third, the supply and demand for the different grades. There is usually a greater difference between the prices paid for the lower grades and for colored cotton, due to the difference of opinion in the trade as to the relative values of such cotton, than is the case for Middling and above.

COMPARISON OF THE OFFICIAL COTTON STANDARDS OF THE UNITED STATES FOR GRADE WITH LIVERPOOL STANDARDS.¹

Since September 1, 1914, Liverpool has been using the so-called International Standards for Upland cotton, which were agreed to at a conference of the representatives of the American and European Exchanges in June, 1913. The Liverpool Cotton Association continued the use of its existing Standards for Gulf and Texas cotton. The International Standards have been replaced by the Liverpool Cotton Association, new standards having been adopted on March 3, 1915, effective September 1, 1916. A complete set of the Liverpool Standards, covering Upland, Texas, and Gulf cotton, have been received recently by the department, and a detailed comparison of these Standards with the United States Official Cotton Standards has been made.²

Liverpool uses the same names for the various grades of American cotton as those of the Official Cotton Standards of the United States, except that the prefix "fully" is used in Liverpool instead of "strict."

¹ For a brief history of the movement to secure universal standards, see U. S. Department of Agriculture, Office of Markets and Rural Organization, Service and Regulatory Announcements, No. 7, 1916.

² See U. S. Department of Agriculture, Office of Markets and Rural Organization, Service and Regulatory Announcements No. 16, 1916.

Generally speaking, the Liverpool Standards for Middling and above are somewhat lower in grade than the corresponding grades of the Official Cotton Standards of the United States, while below Middling the Liverpool Standards are slightly higher in grade. The Liverpool Standards as a whole are brighter in color and contain more leaf than do the corresponding grades of the Official Cotton Standards. The Liverpool Standards also carry less color in the grades below Middling than is the case with the Official Cotton Standards of the United States.

In the following table, the names of the new Liverpool Standards (effective September 1, 1916) for American Upland cotton, are placed opposite the names of the Official Cotton Standards of the United States, to which they most nearly conform in appearance.

LIVERPOOL STANDARD.	OFFICIAL COTTON STANDARD OF THE U. S.
Middling Fair is slightly above-----	Strict Good Middling.
Fully Good Middling is equal to-----	Good Middling.
Good Middling is equal to-----	Strict Middling.
Fully Middling is equal to-----	Middling.
Middling is slightly above-----	Strict Low Middling.
Fully Low Middling is equal to-----	Strict Low Middling.
Low Middling is equal to-----	Low Middling.
Fully Good Ordinary is equal to-----	Strict Good Ordinary.
Good Ordinary is slightly above-----	Good Ordinary.

CLASSES AND CONDITIONS OF COTTON UNTENDERABLE ON FUTURE CONTRACT.

Section 5 of the United States cotton futures Act of August 11, 1916, in stating the form of the future contract exempt under that section from the tax imposed by the act on future contracts for cotton, provides as follows (the fifth subdivision):

That cotton that, because of the presence of extraneous matter of any character or irregularities or defects, is reduced in value below that of Good Ordinary, or cotton that is below the grade of Good Ordinary, or, if tinged, cotton that is below the grade of Low Middling, or, if stained, cotton that is below the grade of Middling, * * * or cotton that is less than seven-eighths of an inch in length of staple, or cotton of perished staple or of immature staple, or cotton that is "gin cut" or reginned, or cotton that is "repacked" or "false packed" or "mixed packed" or "water packed," shall not be delivered on, under, or in settlement of such contract.

It has not been found practicable to attempt to represent by standards in a practical form certain kinds and conditions of cotton that are thus prohibited from being delivered on future contracts. For the purpose of determining disputes referred to the Secretary of Agriculture under the United States cotton futures Act, definitions of some of the terms have been published in United States Department of Agriculture, Office of Markets and Rural Organization,

Service and Regulatory Announcements No. 10. These definitions, which are as nearly as possible in accord with the generally accepted commercial meaning of the terms, are as follows:

Gin-cut cotton.—Gin-cut cotton is cotton that shows damage in ginning, through cutting of the saws, to an extent that reduces its value more than two grades, said grades being of the official cotton standards of the United States.

Gin cutting of a less extent than that mentioned above which reduces the cotton below the value of Good Ordinary would render the cotton untenderable though the extent of injury were less than that described, as the fifth subdivision of section 5 states substantially that cotton the value of which is reduced below that of Good Ordinary shall not be delivered on, under, or in settlement of a contract.

Reginned cotton.—Reginned cotton is such as has passed through the ginning process more than once; also such cotton as after having been ginned is subjected to a cleaning process and then baled.

Repacked cotton.—Repacked cotton will be deemed to mean factors', brokers', and all other samples; also "loose" or miscellaneous lots collected together and rebaled.

False-packed cotton.—Cotton bales will be deemed false packed whenever containing substances entirely foreign to cotton, or containing damaged cotton in the interior, with or without any indication of such damage upon the exterior; also when plated (that is, composed of good cotton upon the exterior and decidedly inferior cotton in the interior) in a manner not to be detected by customary examination; also when containing pickings or linters worked into them.

Mixed-packed cotton.—Mixed-packed cotton shall be deemed to mean such bales as show a difference of more than two grades between samples drawn from the heads, top and bottom sides of the bale, or when such samples show a difference in color exceeding two grades in value, said grades being of the official cotton standards of the United States.

Water-packed cotton.—Water-packed cotton shall be deemed to mean such bales as have been penetrated by water during the baling process, causing damage to the fiber, or bales that through exposure to the weather or by other means, while apparently dry on the exterior, have been damaged by water in the interior.

Cotton of perished staple.—Cotton of perished staple is such as has had the strength of fiber as ordinarily found in cotton destroyed or unduly reduced through exposure, either to the weather before picking or after baling, or to heating by fire, or on account of water packing, or through other causes.

Cotton of immature staple.—Cotton of immature staple is such as has been picked and baled before the fiber has reached a normal state of maturity, resulting in a weakened staple of inferior value.

Cotton of seven-eighths of an inch staple.—After investigation it is likely that a standard for cotton seven-eighths of an inch in length of staple will be issued. In the meantime the examiners authorized to hear disputes will pull the cotton so that the ends will be squared off fairly well without unduly reducing the bulk of the drawn sample. When the measure is applied a fair quantity of the cotton must remain in order to show that the sample has not been pulled too fine before measuring. When thus pulled and measured as cotton experts are accustomed to do its fair average length shall be not less than seven-eighths of an inch, in order that the cotton be tenderable under a contract made in compliance with section 5 of the United States cotton futures Act.

SUMMARY.

The grade of a sample of cotton is determined by the quantity of leaf, dust, sand, motes, and cut seed it contains, together with its color and preparation or quality of ginning.

Cotton should be dry when ginned, and the saws, brushes, and other parts of the gin should be in good condition if a smooth sample is to be obtained.

Cleaners used in connection with the ginning will improve the cotton from one to two grades.

Pickings of a higher grade should be neither mixed nor ginned with pickings that are of a lower grade, since the price paid for a bale of cotton is based on the lowest grade it contains rather than on the highest grade.

Cotton should not be exposed to the weather; moisture causes it to mildew and so lowers the grade.

The new Liverpool Standards adopted on March 3, 1915, for Upland cotton, went into effect September 1, 1916.

The Liverpool Standards for Middling and above are somewhat lower in grade than the corresponding grades of the Official Cotton Standards of the United States, while below Middling the Liverpool Standards are slightly higher in grade.

The practical forms of the Official Cotton Standards of the United States should be carefully protected. The lids on the boxes containing them should be open only when a comparison is being made. Light and dust will render them unfit for use within a comparatively short time.

Low Middling, Middling, and Good Middling cover the bulk of white cotton grown in an average season, and a knowledge of these three grades is usually sufficient for the grower's use.

During the season of 1915-16 in the markets using the Official Cotton Standards of the United States, Low Middling cotton of $\frac{7}{8}$ of an inch to 1 inch staple sold for approximately $\frac{7}{8}$ of a cent below Middling, and Good Middling sold for $\frac{1}{2}$ of a cent above Middling.